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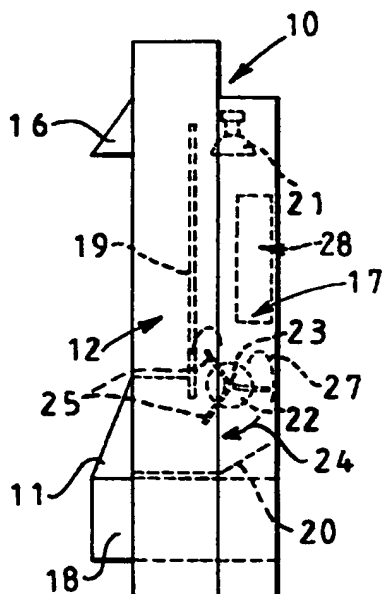
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(58) Field of Search

**UK CL (Edition O) F4W W57
INT CL⁶ F24B 1/18 , F24C 7/00 15/06****(54) Electric fire with simulated flames**

(57) Means for producing a visual effect, such as a simulated flame effect, at a screen, are incorporated into an electrical heating appliance (Figure 2), the means including a light source (21) which transmits light to a multiplicity of light-reflective strips (25) carried on a rotary shaft (23), the rotating strips in use reflecting light to a screen (19) having a matt surface. The strips (25) can interact with other strips (26, 27) which are thus vibrated and also reflect light to the screen, the reflected light appearing as flames above imitation fuel means (11) disposed at the lower front portion of the screen (19).

**FIG 2****GB 2 315 543 A**

**APPARATUS FOR PROVIDING A VISUAL
EFFECT AT A SCREEN**

The present invention relates to apparatus for providing a visual effect at a screen or the like, and has particular application to electrical heating appliances, particularly domestic electric fires where the visual effect is a flame effect.

Many domestic electric fires are intended to be used instead of an open coal fire and are thus located at a fireplace with a fireplace surround. To increase the simulation of an open fire, many such fires are provided with a visible front portion which imitates logs and/or coals. Additionally the electric fire includes means for illuminating the imitation fuel to provide a realistic effect simulating the flames produced on combustion thereof.

U.K. Patent No. 2230335 shows one such arrangement, where the flame effect is produced by arranging behind a front screen of the electric fire a number of ribbon strips, each strip being held vertically between anchors at its opposite ends, with, in one embodiment, its longitudinal edges normal to the screen. The strips, which are held loosely between said anchors to allow them to bow laterally and to 'ripple' along their length, are disposed above a fan blower which in operation blows air upwardly to bow and ripple the strips randomly, so as to cause them randomly to reflect onto the screen light from a red 'fireglow' bulb disposed below fuel simulation elements. Accordingly the reflection of the light by the agitated strips produces a red flame effect on the screen, and thus at the visible front part of the fire.

An object of the invention is to provide apparatus for producing an improved visual effect at a screen or the like, particularly at a screen of an electrical heating appliance.

According to the present invention, apparatus for providing a visual effect at a screen or the like comprises a rotatable member, rotation of which, in use, effects movement of a multiplicity of light-reflective elements, and a light source from which light is directed, in use, towards at least said light-reflective elements, light reflected from said light reflective elements upon rotation of said rotatable member being received, in use, at said screen to provide a visual effect.

Preferably the apparatus is incorporated into an electrical heating appliance which comprises heating means, and imitation fuel means, and in which said screen is, at least partly above the imitation fuel means, with light reflected from said light-reflective elements upon rotation of said rotatable member, in use, being received at said screen to produce said visual effect as a flame effect.

Preferably the rotatable member carries a multiplicity of first light-reflective elements for rotation therewith. Desirably a multiplicity of second light-reflective elements is associated with said screen, rotation of the rotatable member causing interaction between the first and second light-reflective elements so that movement of the second light-reflective elements is effected, with light from said light source being reflected by both the first and second light-reflective elements during their respective motions to produce a visual effect at said screen.

The invention will now be described, by way of example, with reference to and as shown in the accompanying drawings in which

Figure 1 is a schematic front view of an electrical heating apparatus of the invention, showing internal components,

Figure 2 is a schematic side view of the apparatus of claim 1, showing internal components,

Figure 3 is a top plan view of the apparatus of claim 1, showing internal components, and

Figures 4 and 5 are schematic sketches showing respective alternative arrangements of light reflective elements of the apparatus.

Figures 1 to 3 of the drawings show an electrical heating appliance in the form of a domestic electric fire 10, which, as will be described, is of the form having at the lower front thereof a simulated or imitation fuel element 11, normally representing coals and/or logs. In conjunction with the fuel element, the fire incorporates means for producing a flame effect both at the element 11 and also at the front part of the fire above the fuel element, thereby giving the impression that, in use, actual combustion is taking place.

In the drawings, the fire 10 is shown as having an outer surrounding metallic rectangular casing 12, which, at the front of the fire, defines opposite upright sides 13, 14 respectively and a top 15. Directly below the top 15, and arranged to extend between the sides 13, 14, is an outwardly directed hood 16 of conventional form for the outflow of heated air, in use.

Fitted within the casing 12, but extending beyond it, both to the front and rear thereof, is a further casing 17 which, like the casing 12, is preferably of steel. This casing 17 incorporates an electrically powered fan heater 18 which is disposed adjacent the bottom of the casing 12 and projects forwardly thereof as shown in Figures 2 and 3 to support the imitation fuel element 11 which can also extend rearwardly beyond the sides 13 and 14. This element 11 can be formed with translucent colouring.

Supported in any convenient manner between the sides 13,14 and extending fully therebetween, is a translucent screen 19 or equivalent member of perspex or other suitable material, the screen having in one embodiment a matt front surface and, in said one or another embodiment, an orange filter on its rear surface. The matt surface, which provides a suitable light diffusing effect, in use, could be the rear surface of the screen. This screen could be supported solely by means at the opposite sides 13,14 of the casing, or could additionally be supported by part of the fuel element 11. As shown best in Figure 2, the screen can extend somewhat below the top of the element 11, although most of the screen will always extend above the fuel means since, as will be described, this is where the effect will be produced which represents flames rising upwardly from the fuel element 11 to represent the flames produced by combustion. As will be described, a surface, preferably the front surface, of the screen 19 is preferably non-reflecting, so that with or without illumination from within the apparatus, there is no image of the element 11 in the screen.

Carried on or just above the fan heater 18 is a plate 20 which is formed of, or has on its upper surface, reflecting material. The plate is of

horizontal form between the sides 13,14, with it being shown in Figure 1 that the plate does not extend fully between the sides, being disposed centrally therebetween. At its rear, the plate is bent upwardly so as, as will be described, to reflect light generally upwardly and forwardly to the fuel effect element 11 and/or screen 19. This plate 20 can be provided with a red coloured gel, e.g. an orange filter on its upper surface in conjunction with the reflector material of, or carried on, the plate. As shown in Figure 2, the upwardly angled rear part of the plate is in the part of the further casing which extends rearwardly beyond the sides 13,14, this part of the plate lying above the rearwardly extending part of the fan heater 18.

At the top of the part of the further casing 17 which extends rearwardly beyond the sides 13,14, there is disposed a lamp 21 in the form of a halogen 20W dichroic wide beam, low voltage downlighter. As shown best in Figure 2, the lamp is arranged to direct light generally vertically downwardly behind the screen 19, although as stated, the lamp would normally have a wide beam.

Disposed in a side of the further casing 17, at a level just below the top of the fuel element 11, and at a relatively large spacing from the lamp 21, is an electrically driven motor and gearbox arrangement 22, for rotationally driving a shaft 23, schematically shown in the Figures as extending from the gearbox arrangement 22 across substantially the whole of the distance defined between the sides 13 and 14. The shaft is horizontal and preferably of circular cross-section. However, any other suitable cross-sectional shape or form of shaft could be used. As can be seen from Figures 2 and 3, the axis of the shaft 23 is in a vertical plane which lies just behind the rear of the casing 12. It is intended that this

shaft will be driven in a clockwise direction, as viewed from the end of the fire shown in Figure 2, the direction being indicated by the arrow 24. Attached to the shaft 23 around its circumference, and along the whole of its length, are light reflecting elements 25 which are in the form of reflective strips, arranged, for example, not too densely along the shaft.

These strips can be, for example, of naturally reflective material or coated material, such as mirrored or multi-coloured metallised, plastics material, all such strips hereinafter being referred to as tinsel. The strips can be of various colours, for example, red, gold and silver and these can be arranged generally radially around the circular shaft 23, as shown in Figure 2. However, any other suitable form or arrangement can be employed. Although the strips 25 would have a certain inherent rigidity, they would normally not be totally rigid and could thus allow some deformation, particularly at their ends, if required. The tinsel strips thus rotate with the shaft 23, the speed of rotation being, for example, 50 RPM. However, shaft rotation could be varied as required depending upon the density of tinsel strips both circumferentially and/or longitudinally of the shaft. Where the tinsel strips have the capability of some movement of their own relative to the shaft, for example at their ends, this random movement together with the rotating movement of the shaft, which also moves the tinsel strips, randomly causes light from the lamp 21 to be reflected to the screen 19 disposed at the front side of the shaft 23. Moreover, as described, light can also be reflected from the plate 20 upwardly and forwardly onto said screen.

Figure 2 shows that metallised plastics material fingers such as tinsel strips 26 of the same or a similar form to the strip elements 25 are attached to the rear face of the screen 19. Preferably the elements 26

are coloured to reflect the light as red onto the screen. These elements can be of the general 'curved' form as shown in Figure 2, and also in the sketch of Figure 4, in each case it being shown schematically how the ends of the strips 26 are disposed in the path of rotation of the elements 25 on the shaft 23, so that there is interaction and agitation between the rows of strips 25 and 26 thereby causing movements of both elements so as to enhance the random reflections of light from the lamp 21 onto the screen 19. Figure 4 schematically shows how a suitably sized tinsel strip element 25 is configured to interfere with and agitate a pair of spaced adjacent tinsel strips 26 so that at least the respective free ends of the strips 26 are flexible and are caused to move in a general upwards and downwards direction in order to create the random light reflection referred to above. The strips 26 are preferably weighted at their free ends so that said ends vibrate or bounce in an improved manner, when agitated, to provide a reflection which translates into a realistic flame part at the front of the screen 19.

An alternative form of both the strips 25 and 26 is shown in the schematic sketch in Figure 5, the strips 26 here being formed as three fingers extending from a main body part attached to the rear of the screen 19, the three flexible fingers preferably being weighted at their free ends, so that again when agitated, the fingers are vibrated up and down by contact with the strip element 25 on the shaft 23 so as to bounce. Here it can be arranged that there is only interaction with the centre finger, but with the flexible nature of the strip 26 being such that the interaction with the centre finger also causes a corresponding up and down reaction movement with the outer two fingers, again creating random reflection of light onto the screen 19. Alternatively the elements 25 could be wider, to engage the outer fingers also.

Figure 2 further shows that metallised plastics material fingers such as tinsel strips 27, which can be of the same form as the tinsel strips 26, and can be weighted at their free ends, are also attached to a rear face or screen of the further casing 17, behind shaft 23, at a level slightly below that of the strips 26, the strips 27, like the strips 26, extending as densely as required, in a horizontal plane along the length of the rear of the further casing 17 so as to be engaged and agitated by the tinsel strips 25 as they rotate with the shaft 23, this agitation again effecting vibration and bouncing, thereby causing random reflections of light from the lamp 21 onto the screen 19. The strips 25, 26, 27 are preferably all of different shapes and sizes, thereby avoiding conformity and a consequent repetitive reflection pattern, and providing instead, in use, a random pattern suggestive of a true flicker flame.

If all three forms of light-reflecting elements 25, 26 and 27 are provided, then some of their random reflections will be the light which provides the simulated flame effect at the screen 19 which is visible at the front of the fire. As mentioned, reflection of light can also take place from plate 20 to illuminate the imitation fuel element, which is thus part of the overall flame effect, so that the overall impression when viewed from the front of the fire is that there is combustion at the coals and/or logs, this being reinforced by the impression of combustion flames above the element 11 upwards across the screen 19 at its front surface. For convenience, the strips 26 and 27 are not shown in Figures 1 and 3. The strips 27 can be coloured to reflect the light as blue onto the screen.

In particular, when the three strip arrangements 25, 26, and 27 are used together, the flame effect image at the screen 19 is effectively composed of three parts, from the reflections at the strips 25, 26, and 27

respectively. The spacing of the lamp 21 from the strips, and the different lateral spacings of the three strip arrangements from the screen (and the lamp 21), together serve to provide a realistic flame effect where each flame has a lower part at and just above the element 11, a middle part, and an upper part.

The lower part is formed by light reflected from strips 26 which is sharply focused on the screen and will appear red if the strips 26 are coloured accordingly. The middle part is formed by less sharply focused light reflected from strips 25, when they are at an angle to the light beam, during shaft rotation, and the upper part of the flame is formed by the even less sharply focused light reflected from the strips 27, this upper part appearing blue if the strips 27 are coloured accordingly. The strip colours, and thus the flame colours, can however be selected as required. Thus in said preferred embodiment, with the bounce of the agitated (coloured) strips 26 and 27, and varying reflection provided by rotating strips 25, a (composite) flicker flame effect of realistic appearance and colouring is produced at the screen 19 as a result of the above described 3-point reflection.

It will be appreciated that it would be possible to omit one or both of the forms of tinsel strips 26,27, so that, for example, the random reflections could be provided solely by light reflected from the elements 25. Alternatively, the elements 25 could be arranged to interact and agitate solely the strips 26 or, alternatively, solely the strips 27. Moreover in a further embodiment it is possible for the shaft to carry agitating elements which are not light-reflecting, these agitating elements merely interacting with elements which are light-reflecting and which are, for example, attached to the rear of the screen 19, and/or to the rear

of the further casing 17, or elsewhere, in the same manner as described and shown. Accordingly, in such a case, the random light reflections received by the screen 19 would be from the tinsel strips 26, and/or 27 alone, with there being no reflection from any of the agitator elements on the shaft 23.

In a still further embodiment, the rotating shaft with non-light reflecting elements thereon could rotate inside a casing, which carries light reflecting elements, arranged so as to be 'vibrated' or the like, by engagement with the non-light reflecting elements, upon rotation of the shaft. Thus in this case there would again be random reflections from the location equivalent to the elements 25 in Figure 2, namely approximately midway between the screen 19 and the rear face of the further casing 17. With this arrangement of a casing around the rotating shaft, the elements 26 and 27 would normally be omitted, but they could instead be agitated by a further rotating shaft or the like. It will be appreciated that several rows of light reflecting elements could be provided at suitable locations at the rear of the screen, with suitable rotary means being provided to agitate such elements in order to cause reflected light to be received on the front screen. It will also be appreciated that, although less desirable, the light source could be located differently from that shown in Figure 2, for example at the bottom of the further casing 17, with the shaft and strip elements, for example, being further towards the top of the casing. Moreover, reflective plates or the like, such as the plate 20, could also be arranged to reflect light, received from the tinsel strips, and to direct this randomly reflected light to the screen 19.

Light from the lamp 21 could be reflected by suitable reflectors prior to its reflection at any of the tinsel strips. Metallic side reflectors 28 are shown by way of example. More than one lamp could be provided and the lamps could be of different colours.

It will thus be appreciated that in contrast to the prior art arrangement referred to, the agitation of the reflective strips is effected by way of a mechanical action, by rotation of the shaft and/or by physical agitation of the strips, the prior art arrangement relying on movement of the strips purely as a result of air movement effecting them and causing them to ripple and/or bow. The effect of the invention is also more realistic than known arrangements where light from a red bulb is merely randomly blocked in its passage to a screen by a slatted spinning disc or the like over the bulb.

The present arrangement is believed to produce a much more realistic and effective flame effect at the front of the fire, even if only the rotary tinsel strips 25 are provided. With the addition of one or both of the further strips 26 and 27, the total combined effect of the random reflections is much enhanced, providing an even more realistic flame effect. The use of a long focus, i.e. the provision of a relatively large spacing between the lamp and the strips, and the provision of the three strips 25, 26, 27 provides a particularly improved composite flame effect by way of the 3-point reflection previously described. As previously mentioned, although the flame effect may be concentrated at the screen 19, some of the reflected light will also be transmitted to the imitation fuel element 11, although with certain arrangements, reflection to the element 11 could be omitted, or alternatively provided by other means.

A broader aspect of the invention relates to apparatus for providing a visual effect, such as a flame effect, at a screen, panel or the like, without any heating, i.e. omitting the fan heater 18, and optionally also the element 11. All other variations and alternative arrangements referred to with the electric heating appliance are equally applicable to this solely visual effect aspect of the invention. Where a flame effect is produced, it may be desired to retain the element 11. However where the visual effect is other than a flame effect, e.g. a waterfall effect, the element 11 would normally be omitted.

CLAIMS

1. Apparatus for providing a visual effect at a screen or the like, comprising a rotatable member, rotation of which, in use, effects movement of a multiplicity of light-reflective elements, and a light source from which light is directed, in use, towards at least said light reflective elements, light reflected from said light-reflective elements upon rotation of said rotatable member being received, in use, at said screen to provide a visual effect.
2. Apparatus as claimed in Claim 1, wherein the rotatable member carries a multiplicity of first light-reflective elements for rotation therewith.
3. Apparatus as claimed in Claim 2, wherein the first light-reflective elements are strips arranged along the length of said rotatable member.
4. Apparatus as claimed in Claim 3, wherein the first light-reflective elements are arranged around the rotatable member.
5. Apparatus as claimed in any one of Claims 2 to 4, wherein the first light-reflective elements are arranged to extend generally radially of the axis of rotation of the rotatable member.
6. Apparatus as claimed in any one of Claims 2 to 5, wherein each of the first light-reflective elements has a flexible free end portion extending from a relatively rigid portion connected to said rotatable member.

7. Apparatus as claimed in any one of Claims 2 to 6, wherein the rotatable member is a shaft which is rotatably driven, in use, from a motor.
8. Apparatus as claimed in any one of Claims 2 to 7, wherein the rotatable member is disposed behind a rear surface of said screen, and said light source is also arranged behind said rear surface of the screen so as to direct light, in use, onto said first light-reflective elements.
9. Apparatus as claimed in Claim 8, wherein said light source is a downlighter arranged at a position spaced above the rotatable member.
10. Apparatus as claimed in Claim 9, wherein a light-reflective plate is arranged below said rotatable member to reflect light upwardly, in use.
11. Apparatus as claimed in Claim 10, wherein part of the plate is arranged to reflect light forwardly to at least said screen.
12. Apparatus as claimed in any one of Claims 2 to 11, wherein a multiplicity of second light-reflective elements is associated with said screen, rotation of the rotatable member causing interaction between the first and second light-reflective elements so that movement of said second light-reflective elements is effected, with light from said light source being reflected by both the first and second light-reflective elements during their respective motions to produce a visual effect at said screen.
13. Apparatus as claimed in any one of Claims 2 to 12, wherein a multiplicity of further light-reflective elements is arranged at a side of said

rotatable member remote from said screen, rotation of the rotatable member causing interaction between the first and further light-reflective elements so that movement of said further light-reflective elements is effected, with light from said light source being reflected by both the first and further light-reflective elements during their respective motions to produce a visual effect at said screen.

14. Apparatus as claimed in any one of the preceding claims, wherein the screen has a matt surface to diffuse light.

15. Apparatus as claimed in Claim 14, wherein a front surface of the screen, at which the visual effect is viewed, in use, is non-reflecting.

16. An electrical heating appliance incorporating apparatus as claimed in any one of Claims 1 to 15, comprising heating means, and imitation fuel means, said screen being at least partly above the imitation fuel means, with light reflected from said light-reflective elements upon rotation of said rotatable member, in use, being received at said screen to produce said visual effect as a flame effect.

17. An electrical heating appliance as claimed in Claim 16, wherein the imitation fuel means is disposed adjacent the lower end of the screen and at the opposite side thereof from the rotatable member.

18. An electrical heating appliance as claimed in Claim 16, when dependent upon Claim 10 or Claim 11, wherein light is reflected from said light-reflective plate to illuminate said imitation fuel means which is disposed at the lower end of the screen and at the opposite side thereof from the rotatable member.

19. An electrical heating appliance as claimed in any one of Claims 16 to 18, wherein said heating means is a fan heater which supports said imitation fuel means.

20. An electrical heating appliance as claimed in any one of Claims 16 to 19, wherein said flame effect has a lower portion produced by light reflected from light-reflective elements at a rear surface of said screen, and an upper portion produced by light reflected from light-reflective elements disposed rearwardly of said rear surface of the screen.

21. An electrical heating appliance as claimed in Claim 20, wherein the rotatable member is disposed rearwardly of the screen at a position between the light-reflective elements at the screen and those rearwardly thereof, and carries a multiplicity of light-reflective elements for rotation therewith, the light reflected from said elements carried by the rotatable member producing, in use, a central portion of said flame effect at the screen.

22. An electrical heating appliance as claimed in Claim 21, wherein the light source is provided rearwardly of the screen at a position which is spaced above the light-reflective elements so that the nearer to said rear surface of the screen the light reflective elements are disposed, the sharper the light reflected therefrom is focused at the screen.

23. Apparatus for providing a visual effect at a screen or the like, substantially as hereinbefore described, with reference to, and as shown in Figure 4 or Figure 5 of the accompanying drawings.

24. An electrical heating appliance substantially as hereinbefore described, with reference to, and as shown in Figures 1 to 3 of the accompanying drawings.



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Claims searched: All

Examiner: Paul Gavin
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Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): F4W(W57)

Int Cl (Ed.6): F24C(7/00,15/06), F24B(1/18)

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X,P	GB 2 298 073 A (BITECH ENG.) - whole document	1 at least
X	GB 2 276 444 A (UNIDARE ENV. LTD.) -whole document	1 at least
X	GB 2 267 563 A (ELECTRICITY ASS. LTD.) - whole document	1 at least
X	GB 1 592 252 (UNITED GAS IND. LTD.) - whole document	1 at least
X	GB 1 353 021 (UNITED GAS IND. LTD.) - whole document	1 at least
X	GB 1 223 082 (DRUM FIRE INC.) - whole document	1 at least
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